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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/683,649	10/10/2003	Wei Zheng	H0577	1227
45305	7590	04/13/2005	EXAMINER	
RENNER, OTTO, BOISSELLE & SKLAR, LLP (AMDS)			LE, THAO P	
1621 EUCLID AVE - 19TH FLOOR			ART UNIT	
CLEVELAND, OH 44115-2191			PAPER NUMBER	
			2818	

DATE MAILED: 04/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No.	Applicant(s)	
	10/683,649	ZHENG ET AL.	
	Examiner	Art Unit	
	Thao P. Le	2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 March 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-33 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10/10/03 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>2 pages</u> . | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

Election/Restriction

Examiner took notice of election with traverse, remarks made on 03/31/05. The traversal is on the ground(s) that group I merely recited the steps involved in forming the respective features of group I, without reciting additional processing steps. This is found persuasive and therefore, examiner withdrew the previous election/restriction.

Claims 1-33 are pending and presented for examination.

Information Disclosure Statement

Information Disclosure Statement (IDS) filed on **01/19/05** and made of record. The references cited on the PTOL 1449 form have been considered.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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Claims 1-2, 5, 9-10, 13, 17-19, 22, 25-26, 29, 32-33 are rejected under 35 USC 102 (b) as being anticipated by Wu, U.S. Patent No. 6,153,467.

Regarding claims 1, 18, Wu discloses a memory cell and method of forming the memory cell comprising (See Figs. 4-8 and Cols. 1-6):

A semiconductor substrate 100 having at least one trench 150 formed in a surface thereof;

A recessed channel region of a first conductivity type formed in the substrate at the bottom of each trench (Cols. 3-4);

A source region and a drain region 170 both of a second conductivity type semiconductor formed in the substrate on opposing sides of each trench;

A gate dielectric layer 160 formed on the substrate, said gate dielectric layer being formed along the bottom and sidewalls of the trench; and

A control gate 190 formed over the gate dielectric layer above the recessed channel region.

Regarding claims 2, 19, Wu discloses the memory cell of claim 1 and method of forming the memory cell of claim 18 wherein the source region and the drain region are above the recessed channel region (Figs. 4-8).

Regarding claims 5, 16, 22, 32, Wu discloses the substrate is a bulk silicon substrate.

Regarding claims 9, 25, Wu discloses the gate dielectric layer extends above the source region and drain region (see Figs. 4-8).

Regarding claims 10, 26, Wu discloses the gate dielectric is nitride or oxynitride which comprise a standard k dielectric material.

Regarding claims 13, 29, Wu discloses the memory cell of claim 1, further comprising a floating gate layer 175 formed in the trench region and over the gate dielectric layer, the floating gate layer positioned between the source and drain region, and an integrate dielectric layer 180 disposed between the floating and control gates.

Regarding claims 17, 33, Wu discloses the limitations in claims 13, 29, wherein the integrate dielectric layer 180 is and ONO layer (lines 44-45, Col. 4).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3-4, 6-8, 11-13, 15, 20, 23-24, 27-28, 30-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over by Wu, U.S. Patent No. 6,153,467.

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Regarding claims 3, 13, 20, 30, Wu discloses the thickness of the gate dielectric is about 3-20 nm, or 30-200 angstroms which falls into the ranges cited in claims 3, 13 (between 100-300 angstroms (claims 3, 20) or between 50-150 angstroms (claims 13, 30)).

Regarding claims 4, 15, 21, 31, it is obvious that either silicon or SOI substrates is well known to be used as semiconductor substrate in the memory cells such as Wu's because these materials would not affect the functions, manners of the memory cells.

Regarding claims 6-8, 11-12, 23-24, 27-28, it is obvious to one having ordinary skill in the art to know that SONOS is one type of the Wu memory cell with ONO (gate dielectric) disposed between substrate and a silicon gate. It is obvious to one having ordinary skill in the art that the gate dielectric made of nitride or oxynitride in Wu would also be made by other materials such as ONO or Al₂O₃ because these materials carrying out similar functions and because these materials obviously given the reasonable expectation of achieving equivalent results (see U.S. Patent No. 6853587).

When responding to the office action, Applicants' are advice to provide the examiner with the line numbers and page numbers in the application and/or references cited to assist the examiner to locate the appropriate paragraphs.

A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) day from the day of this letter. Failure to respond within the period for response will cause the application to become abandoned (see M.P.E.P 710.02(b)).

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Lee et al., U.S. Patent No. 5,773,343, and Liu, U.S. Patent No. 6,147,377 cited in PTO-982 also discloses all limitations as cited in claims 1 and 18 (102 (b) rejection).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao P. Le whose telephone number is 571-272-1785. The examiner can normally be reached on M-T (7-6).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on 571-272-1787. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Thao P. Le
Examiner
Art Unit 2818